

RESERVE**PATENT SPECIFICATION****672,688***Date of filing Complete Specification: Dec. 1, 1949.**Application Date: Dec. 2, 1948. No. 31284/48.**(Patent of Addition to No. 646,503 dated July 10, 1948.)**Complete Specification Published: May 28, 1952.*

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PROVISIONAL SPECIFICATION**Improvements relating to the Manufacture of Confectionery**

We, ALAN THURBURN SCOTT, a British subject, and MARS LIMITED, a British company, both of Dundee Road, Slough, Buckinghamshire, do hereby declare the nature of this invention to be as follows:—

This invention relates to the manufacture of confectionery in the form of sticky material cut from a continuous slab.

The complete specification of our patent application No. 14936/47 (Serial No. 646,503) discloses a method of dividing the continuous slab into bars, which method includes steps of feeding the slab past knives which are arranged in a row lying transversely to 15 the direction of feeding and which cut the slab longitudinally into a series of strips having a width equal to that of the finished bar, deflecting at least every other strip out of the plane of the slab in such a manner as 20 to part the cut surfaces, and thereafter dividing the continuous strips into bars. The said specification also discloses apparatus for dividing a continuous slab into bars, the apparatus including a conveyor for feeding 25 the slab and leading to a series of knives which are arranged in a row transversely to the direction of feeding and which are adapted to cut the slab longitudinally into a series of strips, and a series of belt conveyors 30 adapted to receive the strips and to deflect at least every other strip out of the plane of the slab in such a manner as to part the cut surfaces.

This invention is concerned with improvements in or modifications of the method and apparatus hereinbefore referred to.

A first object of this invention is to eliminate a transfer belt which we have previously employed between the band on which the slab is formed and the knives.

A second object is to eliminate one of the two sets of cutting implements which we have previously employed for cutting the strips into bars.

A third object is to improve the cutting implements used for cutting the strips into bars.

A fourth object is to reduce the risk that bars may stick together end to end after their separation from a strip. 50

A fifth object is to enable the length and therefore the weight of the bars to be easily varied while the apparatus is running, so that, for example, bars of a standard weight can be produced in spite of variation in the 55 density of the slab.

The first of these objects is attained, according to this invention in one aspect, by apparatus including a conveyor having an endless metal band on which the slab is formed, and a drum at the discharge end, a series of knives in the form of rotary disks mounted on a common spindle and co-operating with a part of the conveyor band at any instant in contact with the drum to 65 cut the slab partly through into a series of strips, and a series of belt conveyors placed to receive respectively the strips leaving the conveyor band, the conveyor belt also co-operating with the knives to complete the 70 cutting-through of the slab and deflecting at least every other strip around a curve tangential to the uncut slab in such a manner as to part the cut surfaces. Since the knives do not completely cut through the slab on 75 the conveyor band there is no risk of their pressing on the band and thereby blunting their edges or damaging the band.

An alternative arrangement for attaining the said first object, according to this 80 invention, includes a band conveyor on which the slab is formed, a series of belt conveyors equal in number to the number of strips into which the slab is to be divided and adapted to receive the slab discharged 85 from the band conveyor, a series of knives in the form of rotary disks mounted on a common spindle above the upper runs of the

conveyor belts and co-operating with a support roller or with a cluster of support pulleys disposed below the said upper runs to sever the slab into strips, and two guide 5 rollers or two clusters of guide pulleys disposed beyond the knives in such positions as respectively to deflect alternate belts below the plane of the slab approaching the knives and to lead the remaining belts in a 10 direction diverging upwards from the said alternate belts.

The said second object is attained, according to this invention, by a method of dividing a continuous slab of confectionery into bars, 15 which includes the steps of feeding the slab past knives which are arranged in a row lying transversely to the direction of feeding and which completely or substantially completely cut the slab longitudinally into a 20 series of strips deflecting at least every other strip out of the plane of the slab in such a manner as to part the cut surfaces, thereafter fanning out the strips transversely to the direction of feeding, returning all the strips 25 to a common plane in which they lie spaced transversely from one another, and while all the strips are at the same level dividing them into individual bars.

Apparatus according to this invention for 30 attaining the said second object includes a series of knives which are arranged in a row lying transversely to the direction of feeding of the continuous slab and which are adapted completely or substantially completely to 35 cut the slab longitudinally into a series of strips, a series of belt conveyors adapted to deflect at least every other strip out of the plane of the slab in such a manner as to part the cut surfaces, these belt conveyors 40 including two sets of guide pulleys or two guide drums keeping the belts in parallel vertical planes while the cut surfaces are being parted, and these conveyors being arranged to fan out the belts transversely to 45 the direction of feeding and thereafter to bring them to a common level, and cutting means adapted to divide all the strips into bars while at the same level.

Apparatus according to the invention for 50 attaining the said third object includes conveying means for feeding a plurality of strips disposed parallel to each other in a common plane and a cutting implement including a horizontal blade lying transversely above the conveying means and so shaped that the strips will rise over it, a vertical blade lying transversely of the conveying means and having a knife edge along its bottom, and operating means 55 adapted firstly to oscillate the vertical blade so that it will co-operate with the horizontal blade to sever the strips into bars, and secondly to oscillate the two blades in unison longitudinally of the conveying means in such a

manner that during each cutting operation 60 the blades move longitudinally at the same or substantially the same speed as the conveying means. Either or both of the blades may be composed of a number of relatively small blades placed end to end. 70 The horizontal blade may have prongs up-standing between the strips that pass over it, these prongs serving to guide the vertical blade in its cutting movement.

The said fourth object is attained, accord- 75 ing to this invention, by apparatus including a first series of belt conveyors for feeding respectively a plurality of strips disposed parallel to each other in a common plane, these conveyors having at their discharge 80 and pulleys rotatable about a common axis, a second series of belt conveyors having at their entry ends pulleys rotatable about the said axis, each conveyor of the first series being adapted to supply a corresponding 85 conveyor of the second series, and strip cutting means adapted to be oscillated longitudinally above the first series of conveyors in such a manner that they travel with these conveyors while cutting and 90 complete the severing of a bar from each strip at a position substantially above the said axis, the conveyor driving means being arranged to drive the second series of 95 conveyors at a higher linear speed than the first series of conveyors. The conveyors of one series may consist of single belts of such a width that the strips or bars overhang the edges of the belt, the conveyors of the other series consisting of twin belts so spaced 100 as to support the longitudinal borders of the under sides of the bars or strips. This arrangement enables all the belts to return around co-axial pulleys placed side by side.

The said fifth object is attained, according 105 to this invention, by apparatus including conveying means for feeding a plurality of strips disposed parallel to each other in a common plane, strip cutting means on a carrier adapted to be oscillated longitudinally 110 of the conveying means, cam mechanism for oscillating said carrier and adapted to move it in the feeding direction at a substantially constant speed while the strip-cutting means are operated, and control means operable 115 for varying the ratio of the speed of the conveying means to the speed of the cam mechanism over a range which includes the value of the ratio at which the speed of movement of the carrier of the strip-cutting 120 means in the feeding direction is equal to the linear speed of the conveyor. Only when the speed ratio has the said value will the strip-cutting means operate without moving longitudinally in relation to the 125 strips; however slight, departures from the said value will not appreciably interfere with the cutting operation and will enable

the length of the bars that are cut from the strips to be varied at will over a limited range.

One embodiment of the invention is arranged as follows:—

5 A continuous slab of sticky confectionery e.g. nougat, is formed on a metal conveyor band which returns around a large drum at the delivery end of the conveyor. The slab is deflected off the band by a doctor blade when inclined downwards at a small angle to the horizontal and transferred by a series of driven rollers to a series of V-belts passing around a circumferentially grooved drum at the entry end of the belt conveyors. 10 These belts rise from this drum at an angle of 25° to the horizontal to a grooved counter roller above which are a series of disk knives mounted on a common spindle and adapted to cut the slab fed by the belts into strips which are carried forward respectively by the belts. Alternate belts continue past the counter roller at the same inclination and parallel to one another to an upper grooved guide roller. The remaining belts 20 are deflected round the counter roller to a substantially horizontal direction and pass parallel to one another to a lower grooved guide roller. The two sets of belts fan out laterally beyond the two guide rollers, and 25 the upper set is inclined downwards so that both sets attain the same level at a series of return pulleys rotatable about a common axis at the discharge end of the fanned conveyors.

30 The strips are now transferred to a second series of belt conveyors running parallel to each other. These conveyors may be of the twin-belt type hereinbefore referred to, the two entry-end pulleys of each being placed 40 one on each side of the discharge end pulley of the corresponding conveyor of the first series. In this case the twin-belt conveyors carry the strips in a common horizontal plane

through the strip-cutting device and deliver the cut bars to a series of higher-speed single-belt conveyors. The strip-cutting device may include a reciprocating carriage arranged generally as described in our said specification, with a first cam mechanism for reciprocating the carriage and a second cam mechanism 50 for operating the strip cutting blade. However, in the present case all cutting is done at the same level, the rather inaccessible lower deck of our earlier arrangement being eliminated. A horizontal blade of narrow wedge section is fixed transversely to the carriage and lies across the tops of the belts. Its sharp edge faces the approaching strips and lifts them clear of the belts. This blade carries prongs upstanding from its upper surface, and the sides of these prongs facing away from the approaching strips lie in a common vertical plane with the broad edge of the blade. A transverse blade lying in a vertical plane and having a knife edge 65 directed downwards is carried by two cam-actuated tappets mounted on the carriage. This blade is resiliently urged against the said faces of the prongs. In operation the vertical blade cuts the strips into bars, the 70 part of each strip immediately following the cutting plane being supported by the lower blade and located laterally by the prongs on this blade. The conveyor driving mechanism and the cam driving mechanism may be 75 operated from a common driving member, generally as described in our said specification, except that a change-speed gear the ratio of which can be varied continuously over a small range e.g. a "P.I.V." gear, is 80 provided in the cam driving mechanism.

Dated this 2nd day of December, 1948.

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COMPLETE SPECIFICATION

Improvements relating to the Manufacture of Confectionery

We, ALAN THREBURN SCOTT, a British subject, and MARS LIMITED, a British company, both of Dundee Road, Slough, 85 Buckinghamshire, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

90 This invention relates to the manufacture of confectionery in the form of sticky material cut from a continuous slab.

The complete specification of our patent application No. 14936/47 (Serial No. 646,503) 95 discloses a method of dividing the continuous slab of confectionery into bars, which method includes the steps of feeding the

slab continuously past knives which are arranged in a row lying transversely to the direction of feeding and which cut the slab 100 longitudinally into a series of strips, deflecting every other strip along a path the entry end portion of which diverges from the path of the remaining strips so as to part the cut surfaces by separation in their planes and 105 the delivery end portion of which converges into coincidence with the second-mentioned path, dividing the moving strips into individual pieces, each piece on division being advanced relatively to the strip from 110 which it was divided, and fanning out transversely to the direction of feeding the strips or the lines of pieces formed from

them while on the said two paths, whereby the cut pieces are delivered in parallel rows and spaced both longitudinally and transversely from each other in a common path. 5 The strips were fanned out before they were divided and they were divided before they were fed to the common plane.

The said specification also discloses apparatus for dividing a continuous slab of 10 confectionery into bars, the apparatus including means for continuously feeding the slab to a series of knives which are arranged in a row lying transversely to the direction of feeding and which are adapted to cut the 15 slab longitudinally into a series of strips, belt conveyors adapted to deflect every other strip along a path diverging from the path of the remaining strips so as to part the cut surfaces by separation in their planes, 20 said conveyors fanning out transversely in the said two paths, and the two paths converging to a common plane, and means disposed between said knives and the delivery end of the apparatus for dividing 25 the moving continuous strips into discontinuous strips to form the individual bars. Such apparatus will hereinafter be referred to as apparatus of the kind specified.

This invention is concerned with improvements in or modifications of the method and apparatus hereinbefore referred to.

The object of this invention is to eliminate one of the two sets of cutting implements which we have previously employed for 35 cutting the strips into bars.

This object is attained, according to this invention, by a method of dividing a continuous slab of confectionery into bars, which includes the steps of feeding the slab past knives which are arranged in a row lying transversely to the direction of feeding and which completely or substantially completely cut the slab longitudinally into a series of continuous strips having a width 45 equal to that of the bars, deflecting every other strip along a path diverging out of the plane of the remaining strips so as to part the cut surfaces, fanning out the continuous strips transversely to the direction of feeding, 50 returning all the continuous strips to a common plane in which they lie spaced transversely from one another, and while all the strips are in the same plane dividing them into individual bars.

55 Apparatus according to this invention for attaining the said object includes means for continuously feeding the slab, a series of knives which are arranged in a row lying transversely to the direction of feeding of 90 the continuous slab and which are adapted completely or substantially completely to cut the slab longitudinally into a series of continuous strips, belt conveyors adapted to deflect every other strip along a path

diverging out of the plane of the remaining strips so as to part the cut surfaces, two sets of guide pulleys or two guide drums over which the conveyors fan out transversely to the direction of feeding, the conveyors being adapted thereafter to bring the strips 70 to a common plane, and cutting means adapted thereafter to divide all the strips into bars while in the same plane.

The means for continuously feeding the slab may include a band conveyor on which 75 the slab is formed and from which the slab is delivered to upper runs of the belt conveyors which are equal in number to the number of strips into which the slab is to be divided by the knives comprising rotary 80 disks mounted on a common spindle above the upper runs of the belt conveyors and co-operating with a grooved counter roller disposed below said upper runs to sever the slab into strips which are thereafter caused 85 by said belt conveyors to follow said diverging paths and to be fanned out transversely to the direction of feeding.

Alternatively the means for continuously feeding the slab comprises an endless metal 90 band on which the slab is formed, said band at the discharge end of the feeding means passing around a drum in relation to which and the entry end of the belt conveyors the knives are so arranged that the slab is partly 95 cut through as it leaves the drum and completely cut through as it is transferred to said belt conveyors.

The said cutting means may include a horizontal blade lying transversely above the 100 conveying means and so shaped that the strips will rise over it, a vertical blade lying transversely of the conveying means and having a knife edge along its bottom, and operating means adapted firstly to oscillate 105 the vertical blade so that it will co-operate with the horizontal blade to sever the strips into bars, and secondly to oscillate the two blades in unison longitudinally of the conveying means in such a manner that 110 during each cutting operation the blades move longitudinally at the same or substantially the same speed as the conveying means. Either or both of the blades may be a unitary element or composed of a 115 number of relatively small blades placed close together or spaced apart end to end. Prongs may project upwards from the horizontal blade between the strips that pass over it, these prongs serving to guide the 120 vertical blade in its cutting movement. A roller having its axis parallel to the blade edges may be so disposed as to lie above a bar upon completion of its severance from a strip.

The strip-cutting means may be mounted on a carrier adapted to be oscillated longitudinally of the conveying means, and

provided with cam mechanism for oscillating said carrier and adapted to move it in the feeding direction at a substantially constant speed while the strip-cutting means are operated, and control means operable for varying the ratio of the speed of the conveying means to the speed of the cam mechanism to vary the length of the bars cut from the strips.

10 Two embodiments of the invention will be described with reference to the accompanying diagrammatic drawings, in which:—

Figures 1A and 1B together constitute a side elevation of the first embodiment, a part 15 of Figure 1A being shown in section.

Figures 2A and 2B together constitute a plan of the apparatus shown in Figures 1A and 1B, Figure 2B being partly in section on the line 2-2 in Figure 1B.

20 Figure 3 is a section to a larger scale on the line 3-3 in Figure 2B.

Figures 4 and 5 are respectively elevations of two face cams.

Figure 6 is a section of part of a multiple 25 belt pulley appearing in Figures 2B and 3.

Figure 7 is an end elevation, to a larger scale, of a part of strip-cutting mechanism appearing in Figure 3, and as viewed from the left-hand side of Figure 3.

30 Figure 8 is a section on the line 8-8 in Figure 7.

Figure 9 is a plan of the parts appearing in Figure 7.

Figure 10 is a sectional end elevation of a 35 detail of the apparatus appearing in Figures 1A and 2A.

Figure 11 is a side elevation in schematic form of the second embodiment, being a modification of the apparatus shown in 40 Figures 1A and 2A.

Figure 12 is a plan of the apparatus shown in Figure 11.

In the first of these embodiments a continuous slab of sticky confectionery, 45 e.g. nougat, is formed on a metal conveyor band 20 (Figure 1A) which returns around a large drum 21 at the delivery end of the conveyor. The slab is deflected off the band by a doctor blade 22 when inclined 50 downwards at a small angle to the horizontal and transferred by a series of driven transfer rollers 23 to a series of belt conveyors, each consisting of three conveyor sections working in series. The first sections comprise V-belts 55 24A and 24B passing around a circumferentially grooved drum 25 at the entry end of the conveyor system. These belts rise from the drum 25 to a grooved counter roller 26 above which are a series of disk 60 knives 27 mounted on a common spindle 28 and adapted to cut the slab fed by the belts into strips which are carried forward respectively by the belts. The knives 27 bear resiliently on tires of hard synthetic rubber 17.

(Figure 10) having internal flanges 16 which 65 are located in circumferential grooves in the counter roller 26. Alternate belts 24A continue past the counter roller 26 at the same inclination and parallel to one another to an upper grooved guide roller 29. The 70 remaining belts 24B are deflected round the counter roller 26 to a nearly horizontal direction and pass parallel to one another to a lower grooved guide roller 30. Guide plates 19A and 19B (shown in Figure 1A, 75 but broken away in Figure 2A) are placed between the disk knives, being supported on transverse rods 18. The plates 19A are above the belts 24A, and the bottom edges of the plates are parallel to and spaced from 80 the belts. The plates 19B are above the belts 24B, their bottom edges being also parallel to and spaced from the belts 24B. The two sets of belts fan out laterally beyond the two guide rollers 29 and 30, as shown 85 in Figure 2A, and the upper set is inclined downwards so that both sets attain the same level at a grooved return drum 31 at the discharge end of the fanned conveyors.

The strips are now transferred to the 90 second sections of belt conveyors, which run parallel to each other. These conveyors consist of twin belts 32A and 32B, the two entry-end grooves of each on the drum 31 being placed one on each side of the discharge- 95 end groove of the corresponding conveyor belt of the first section. The twin belts are so spaced as to support the longitudinal borders of the under sides of the strips of nougat. The twin-belt conveyors carry the 100 strips in a common horizontal plane into the strip-cutting device from which the cut bars are delivered to the third conveyor sections which consist of higher-speed single-belt conveyors 33. The discharge ends of the 105 twin-belt conveyors and the entry ends of the higher-speed conveyors, are returned around a cluster of co-axial pulleys denoted as a whole by 24 in Figures 1B and 2B. As shown in Figure 6, this cluster consists 110 of pulleys such as 35, 36 and 37 having grooves for the twin belts 32A and 32B, and pulleys such as 38 and 39 having grooves for the belts 33, the pulleys being freely rotatable on a shaft 40. 115

The drum 25, and the rollers 26, 29 and 30 are mounted respectively on shafts 41, 42, 43 and 44, and these shafts as well as the knife spindle 28, are rotatable in bearings in side frame members 45 and 46 which are 120 carried on standards 47 and 48.

A driving shaft 49, which is connected to the drive for the conveyor band 20, drives through a reduction gear 50, 51 a shaft 52. A sprocket 53 on this shaft drives 125 through a chain 54 a sprocket 55 on the shaft 42. A sprocket 56 on the shaft 42 drives, through a chain 57 and a sprocket 58

on the knife spindle, the knives 27 at a peripheral speed equal to that of the roller 26. The shaft 41 is connected to the shaft 42 by a chain 59 and sprockets 60 and 61 so arranged that the peripheral speeds of the drum 25 and of the counter roller 26 are equal.

The drum shaft 41 drives the transfer rollers 23 through gear boxes 62 and 63 on 10 the side frame members 45 and 46.

The drum 31 (Figures 1B and 2B) is attached to a shaft 64. The discharge ends of the higher speed conveyors 33 are returned around a grooved drum 65 attached to a 15 shaft 66. The shaft 64 and the shaft 40 of the pulley cluster 34 are mounted in bearings in two side frame members 67 and 68 carried on standards 69 and 70. The shaft 66 is mounted in bearings 71 carried by extension 20 frame 73.

The first sections of conveyor belts 24A and 24B are provided with intermediate support rollers 74 carried by brackets on intermediate frame bars 75 spanning between 25 the standards 48 and 69.

The driving shaft 49 drives through a reduction gear 76, 77 (Figure 1B) a shaft 72 (Figure 2B) connected by sprockets 78 and 79 and a chain 80 to the shaft 64 of the drum 31, which is driven at the same peripheral speed as the drum 25. The shaft 49 also transmits a drive, through sprockets 81 and 82 and a chain 83, a change-speed gear 84 of continuously variable velocity ratio and 35 bevel gearing 85, 86, to a counter shaft 87, which drives a cam shaft 88 through sprockets 89 and 90 and a chain 91. The cam shaft drives the drum shaft 66 through sprockets 92 and 93 and a chain 94. The transmission 40 ratio is such that the peripheral speed of the drum 66 substantially exceeds that of the drum 31 at all ratios of the change-speed gearing 84.

A carrier includes two side plates 95 and 45 96 rigidly connected together by transverse bars 97 and guided for longitudinal movement by flanged wheels 98 rotatably mounted on the plates 95 and 96 and running on tracks 99 on the frame members 67 and 68. 50 Each side plate is rigidly connected to a horizontal actuating bar 100 slideable in a fixed guide 101 and connected by a link 102 to a lever 103 fixed on a rocking shaft 104. A cam disk 105 (Figures 2B and 4) fixed on 55 the cam shaft 88 has on one face a cam groove 106 engaged by a cam-follower pin 107 on a lever 103 fixed on the rocking shaft 104. The groove 106 is so shaped as to cause the carrier to perform a short reciprocating 60 movement in which the greater part of the forward stroke is at constant speed approximately equal to that of the twin belts 32A and 32B, and in which the return stroke is considerably more rapid.

A knife blade 109 (Figure 3) extending 65 across all the conveyors is fixed to a beam 110 which passes freely through apertures, such as III, in the plates 95 and 96 and spans between two vertical actuating bars 112 slideable in guides 113 on the plates 95 70 and 96. Levers 114, fast on a rocking shaft 115 journalled in the carriage, are coupled by pin-and-slot connections to the bars 112 which are thereby constrained to rise and fall in unison. A lever 116 fast on the 75 shaft 115 is coupled by a link 117 to a horizontal bar 118 slideable in a fixed guide 119 and carrying a cam-follower pin 120 engaged in a cam groove 121 (Figure 5) in the face of a cam disk 122 fixed on the cam shaft 88. 80 The cam groove 121 is adapted to cause the knife blade 109, during the forward stroke of the carriage, first to descend at a substantially constant, relatively low speed as far as the cutting point and then to rise more 85 rapidly, and during the rearward stroke of the carriage, to dwell in its uppermost position. The form of the cam groove 121 must of course take account of the relative movement between the carriage and the 90 axis of the shaft 88, though this movement is small in relation to the total movement of the link 117 during each stroke of the knife.

A transverse beam 125, fixed to the 95 carriage side plates 95 and 96 by brackets such as 126 (Figure 3) is of thick L section and is disposed with its vertical limb at the approach side of the oscillating knife beam 110 and its horizontal limb below the 100 beam 110. A horizontal knife blade 127 is fixed to the bottom of the beam 125 which is provided with channels 128 in its under surface placed to permit passage through the beam of the nougat strips such as 129. 105 L-shaped prongs 130 are placed between the conveyors with one limb fastened to the under side of the blade 127 and the other limb projecting upwards at the discharge side of the blade 109 and serving as a guide 110 for maintaining the blade 109 in sliding engagement with the adjacent side face of the beam 125. The discharge edge of the blade 127 is flush with the said side face so that the two blades will co-operate with a 115 shearing action. The entry edge of the blade 127 is bevelled on its upper face at 127' in the channels 128, so as to assist the strips 129 in rising over the blade. Figures 7, 8 and 9 show how the horizontal blade 127 120 is fixed to the beam 125 by screws 131 passing vertically through the horizontal limb of the beam 125 and engaged in screw sockets 132 welded to the blade 127. The blade guide members 130 are fixed to the 125 beam 125 by screws 133 passing upwards through the parts 130 and 127 into tapped holes in the beam 125.

At the discharge side of the cutting blades is a transverse roller 184 carried by a shaft 135 and brackets 136 on the carriage side frames 95 and 96. The roller 184 is arranged 5 to engage the tops of the nougat bars 129' as they are cut off from the strips and to press them down on the conveyor belts 33, thereby ensuring that they will be pulled away from the blade 109.

10 In operation, a continuous slab of nougat carried by the belt 20 is parted from this belt by the doctor blade 22 and transferred by the small driven rollers 23 continuously to the rising belts 24A and 24B. These 15 belts carry the slab through the knives 27, and the resulting strips of nougat ride under the guide plates 19A or 19B and are thereby kept in contact with the belts 24A or 24B. The belts 24A carry every other strip along 20 a path which lies in the plane containing that part of the slab approaching the knives.

The belts 24B take the remaining strips along a path diverging downwards from this plane, so that the cut surfaces are separated 25 rapidly enough to eliminate risk of their sticking together.

The belts 24A and 24B bring all the strips to a common horizontal plane at the point where they are transferred to the twin belts, 30 32A and 32B which carry the strips forward along parallel paths. The knife carriage, when moving over the main part of its stroke to the right as viewed in Figures 1B, 2B and 3, has a constant speed equal or 35 very nearly equal to the speed of the twin belts. During the middle part of each such stroke the cam mechanism shown in Figure 5 operates to cause the knife blade 109 to descend and co-operate with the blade 127 40 so as to divide the moving continuous strips 129 into bars 129'. Thereafter the cam mechanism causes the blade 109 to rise clear of the strips in readiness for the return stroke of the carriage, during which the 45 horizontal blade 127 slides under the approaching strips, lifting them clear of the belts in readiness for the next cut.

Each cutting operation is completed when the cutting edges of the blades are substantially above the shaft 40, as in Figure 3. The newly separated bars 129' are therefore supported by the higher-speed conveyor belts 33 so that these bars are accelerated and become spaced from the next succeeding 55 bars. The bars therefore now lie in a common plane and spaced from one another in both the longitudinal and transverse directions.

If desired, the conveyors 33 may be 60 lengthened and provided with a grooved guide roller and a narrower delivery end roller, so that the belts converge and thereby reduce the transverse spacing of the bars in readiness for their transfer to a conveyor

(not shown) forming a part of a chocolate-enrobing machine.

The change-speed gear 84 is normally so set that the speed of the knife carriage, when moving over the main part of its forward stroke, is exactly equal to the speed of the 70 twin conveyors 32A and 32B. If the density of the nougat slab should for any reason increase or decrease from the standard value, a corresponding increase or decrease in the weight of the bars can be avoided by adjusting 75 the gear 84 so as to increase or reduce respectively the speed of the cam mechanism relative to the speed of the belts 32A and 32B so as to alter the cutting frequency and thus the length of the bars cut from the 80 strips. The minor adjustments found necessary in practice, and the resulting small differences between the speed of the strips and the speed of the knife carriage during the cutting operations, are insufficient to 85 prevent the cuts from being clean and substantially square.

The embodiment hereinbefore described may be modified by replacing the twin-belt conveyors 32A and 32B by a single wide 90 band conveyor having a band, e.g. of woven wire such as is used in chocolate enrobing machines, flexible enough to be returned about rollers of small diameter. The entry end roller of this band conveyor is placed 95 close to the discharge end drum of the fanned-out conveyors. The higher speed conveyor belts 33 may likewise be replaced by a single wide band conveyor having its small entry end roller placed close to the discharge end 100 roller of the immediately preceding conveyor. The substitution of a band conveyor for the twin-belt conveyors enables the width of the apparatus to be substantially reduced.

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The modified form of apparatus shown in Figures 11 and 12 is in some respects like the apparatus shown in Figures 1A and 2A; corresponding parts in the two examples are denoted by the same reference numerals, 110 those employed in Figures 10 and 11 being dashed.

In the modified arrangement the knives 27' are close enough to the slab conveyor band 20', where it begins to return around 115 the drum 21', to cut the slab partly through into a series of strips. The partly divided slab is transferred from the band 20' to the belts 24A' and 24B'; these carry the slab closer into the knives which thereby complete the operation of cutting the slab into strips. The belts fan out on leaving the grooved drum 25', and the support rollers 137 and 138 serve only to cause the path of every other strip to diverge upwards from 120 the path of the remaining strips, so that the cut surfaces are rapidly parted by relative vertical displacement before they are required.

to move apart to any appreciable extent laterally.

HAVING NOW particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of dividing a continuous slab of confectionery into bars, which includes the steps of feeding the slab past knives which are arranged in a row lying transversely to the direction of feeding and which completely or substantially completely cut the slab longitudinally into a series of continuous strips having a width equal to that of the bars, deflecting every other strip along a path diverging out of the plane of the remaining strips so as to part the cut surfaces, fanning out the continuous strips transversely to the direction of feeding, returning all the continuous strips to a common plane in which they lie spaced transversely from one another, and while all the strips are in the same plane dividing them into individual bars.

2. Apparatus for dividing a continuous slab of confectionery into bars and including means for continuously feeding the slab, a series of knives which are arranged in a row lying transversely to the direction of feeding of the continuous slab and which are adapted completely or substantially completely to cut the slab longitudinally into a series of continuous strips, belt conveyors adapted to deflect every other strip along a path diverging out of the plane of the remaining strips so as to part the cut surfaces, two sets of guide pulleys or two guide drums over which the conveyors fan out transversely to the direction of feeding, the conveyors being adapted thereafter to bring the strips to a common plane, and cutting means adapted thereafter to divide all the strips into bars while in the same plane.

3. Apparatus according to Claim 2, wherein the means for continuously feeding the slab includes a band conveyor on which the slab is formed and from which the slab is delivered to upper runs of the belt conveyors which are equal in number to the number of strips into which the slab is to be divided by the knives comprising rotary disks mounted on a common spindle above the upper runs of the belt conveyors and cooperating with a grooved counter roller disposed below said upper runs to sever the slabs into strips which are thereafter caused by said belt conveyors to follow said diverging paths and to be fanned out transversely to the direction of feeding.

4. Apparatus according to Claim 2 or 3, wherein the means for continuously feeding the slab comprises an endless metal band on which the slab is formed, said band at the

discharge end of the feeding means passing around a drum in relation to which and the entry end of the belt conveyors the knives are so arranged that the slab is partly cut through as it leaves the drum and completely cut through as it is transferred to said belt conveyors.

5. Apparatus according to any of Claims 2-4, wherein the cutting means is adapted to divide all the strips into bars while being conveyed parallel to each other in the common plane, said cutting means including a horizontal blade lying transversely above the conveying means and so shaped that the strips will rise over it, and a vertical blade lying transversely of the conveying means and having a knife edge along its bottom, and wherein operating means for the cutting means is adapted firstly to oscillate the vertical blade so that it will co-operate with the horizontal blade to sever the strips into bars, and secondly to oscillate the two blades in unison longitudinally of the conveying means in such a manner that during each cutting operation the blades move longitudinally at the same or substantially the same speed as the conveying means.

6. Apparatus according to Claim 5, wherein prongs projecting upwards from the horizontal blade between the strips that pass over it serve to guide the vertical blade in its cutting movement.

7. Apparatus according to Claim 5 or 6, wherein a roller having its axis parallel to the blade edges is so disposed as to lie above a bar upon completion of its severance from a strip.

8. Apparatus according to any of the preceding Claims 5-7, wherein the strip cutting means is mounted on a carrier adapted to be oscillated longitudinally of the conveying means by cam mechanism adapted to move the carrier in the feeding direction at a substantially constant speed while the strip-cutting means are operated, control means being provided for varying the relative speeds of the conveying means and the cam mechanism so as to vary the length of the bars cut from the strips.

9. Apparatus according to any of the preceding Claims 5-8, wherein the belt conveyors that bring the strips to a common plane comprise a first conveyor section and the conveying means associated with the strip cutting means comprise parallel belts forming a second conveyor section while a third conveyor section is composed of parallel conveyor belts to which the separated bars are transferred from the second conveyor section, said third section being moved at a higher speed than said second conveyor section for the purpose herein set forth.

10. The modification of the apparatus.

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claimed in Claim 9, wherein the multiple belt conveyors in the second and third conveyor sections are replaced respectively by two single band conveyors.

5 11. The apparatus for dividing a continuous slab of confectionery into bars, hereinbefore described as an embodiment of the invention with reference to and shown in Figures 1A to 9 of the accompanying 10 drawings.

12. Apparatus according to Claim 11 as modified as hereinbefore described with reference to Figures 11 and 12 of the accompanying drawings.

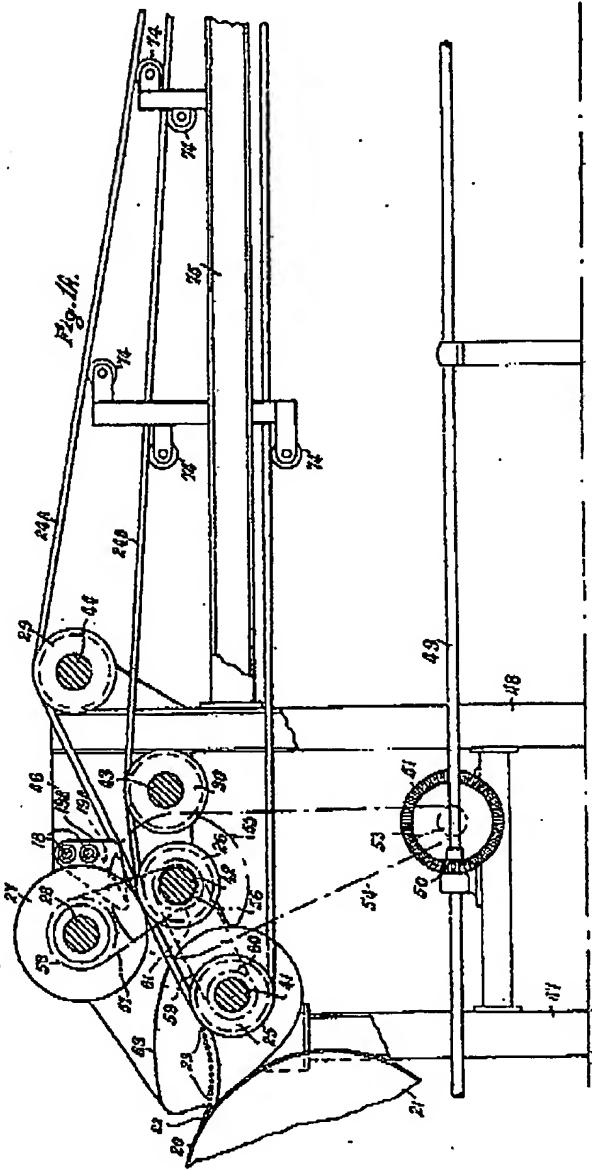
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SHEET 1

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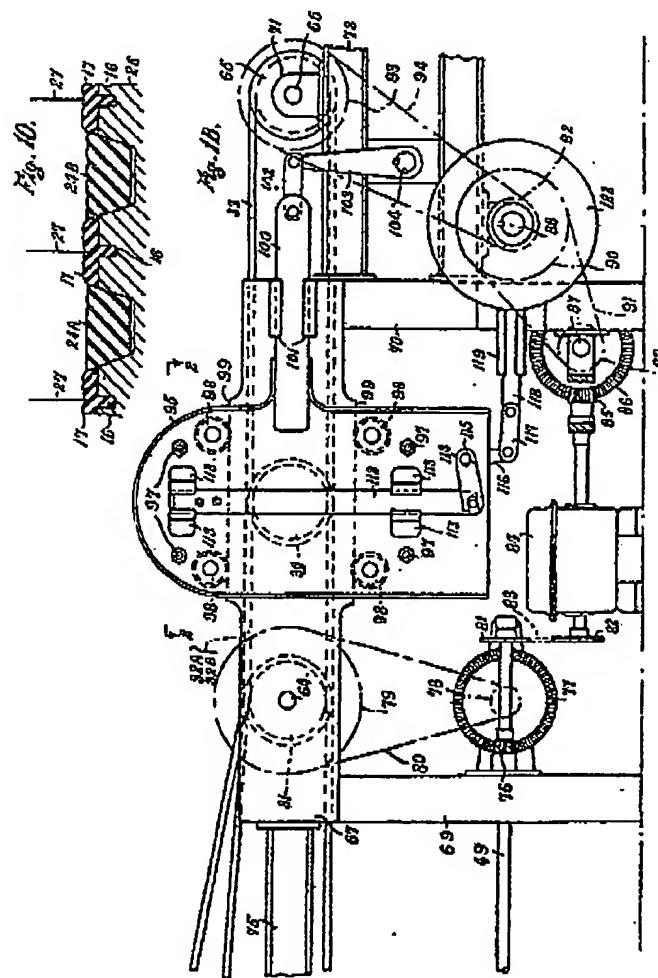


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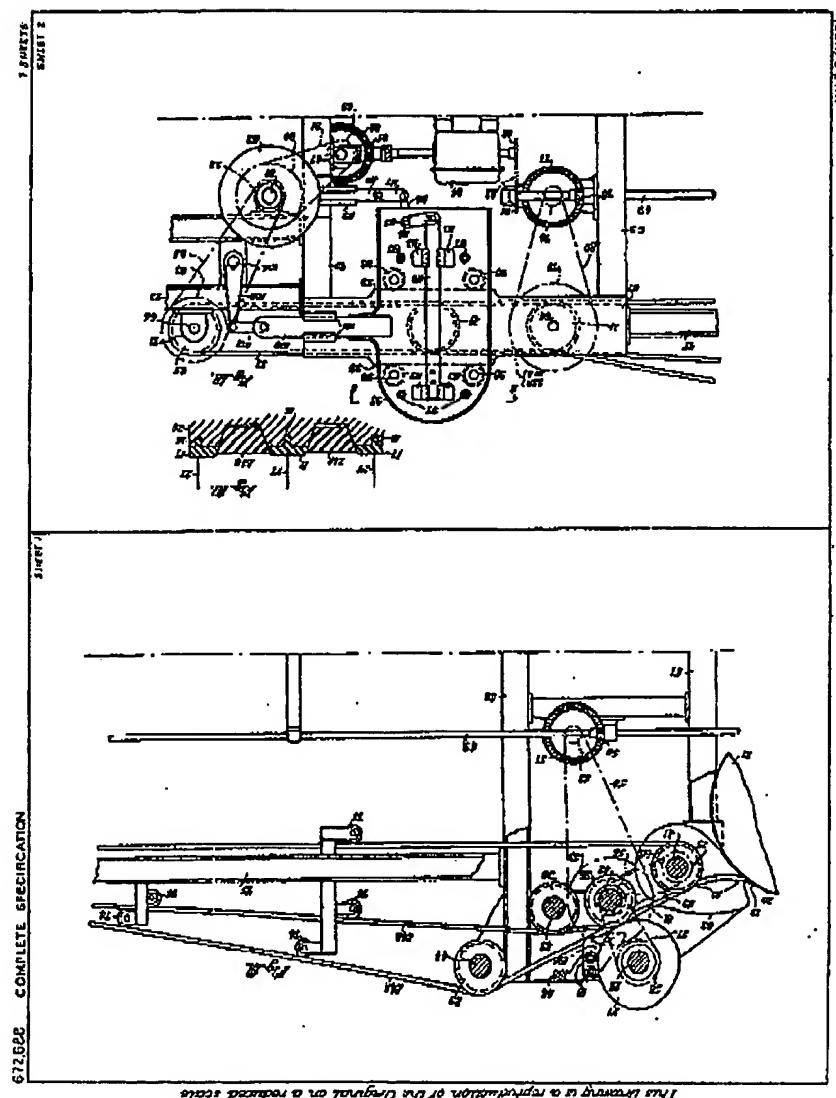
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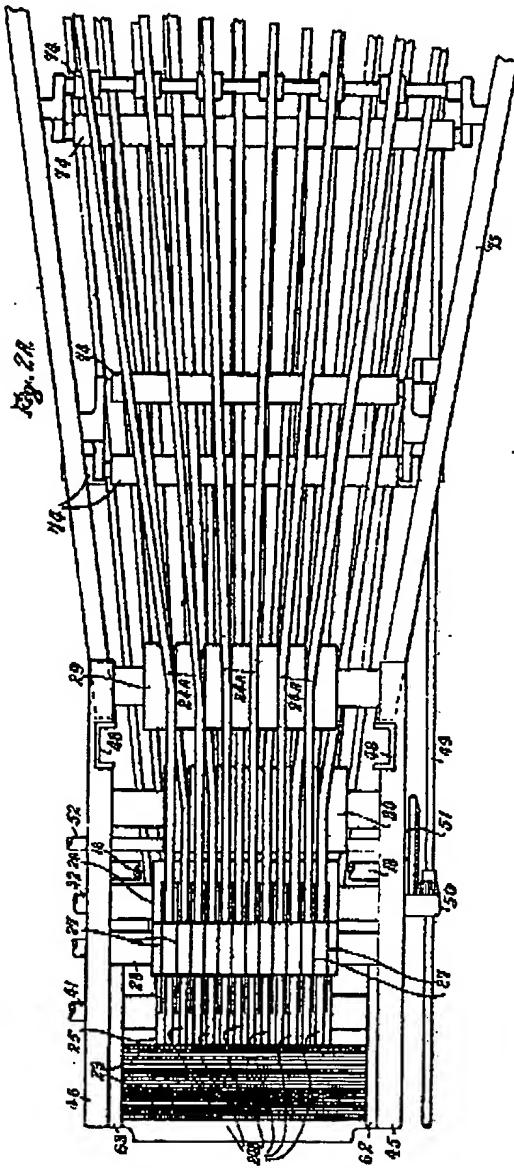


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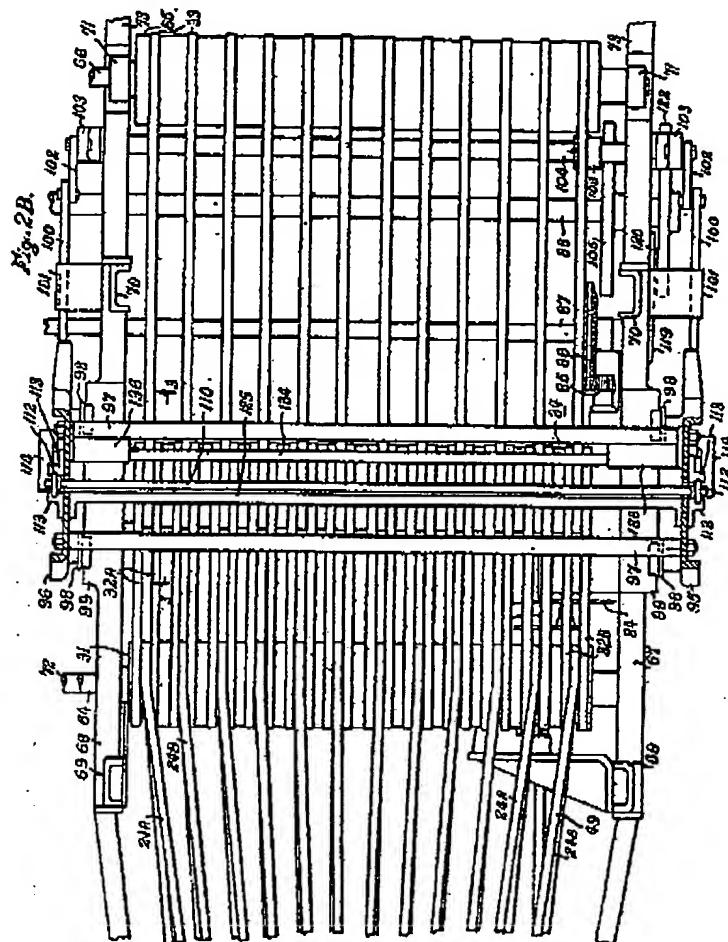
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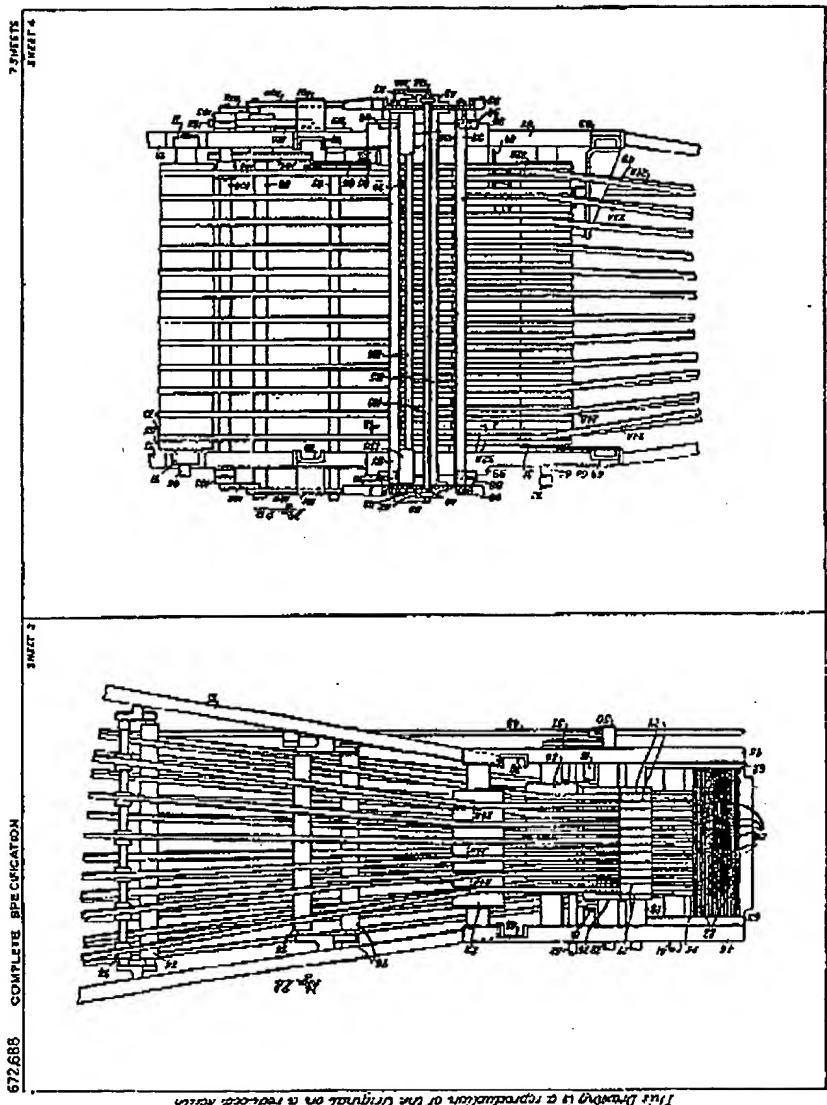
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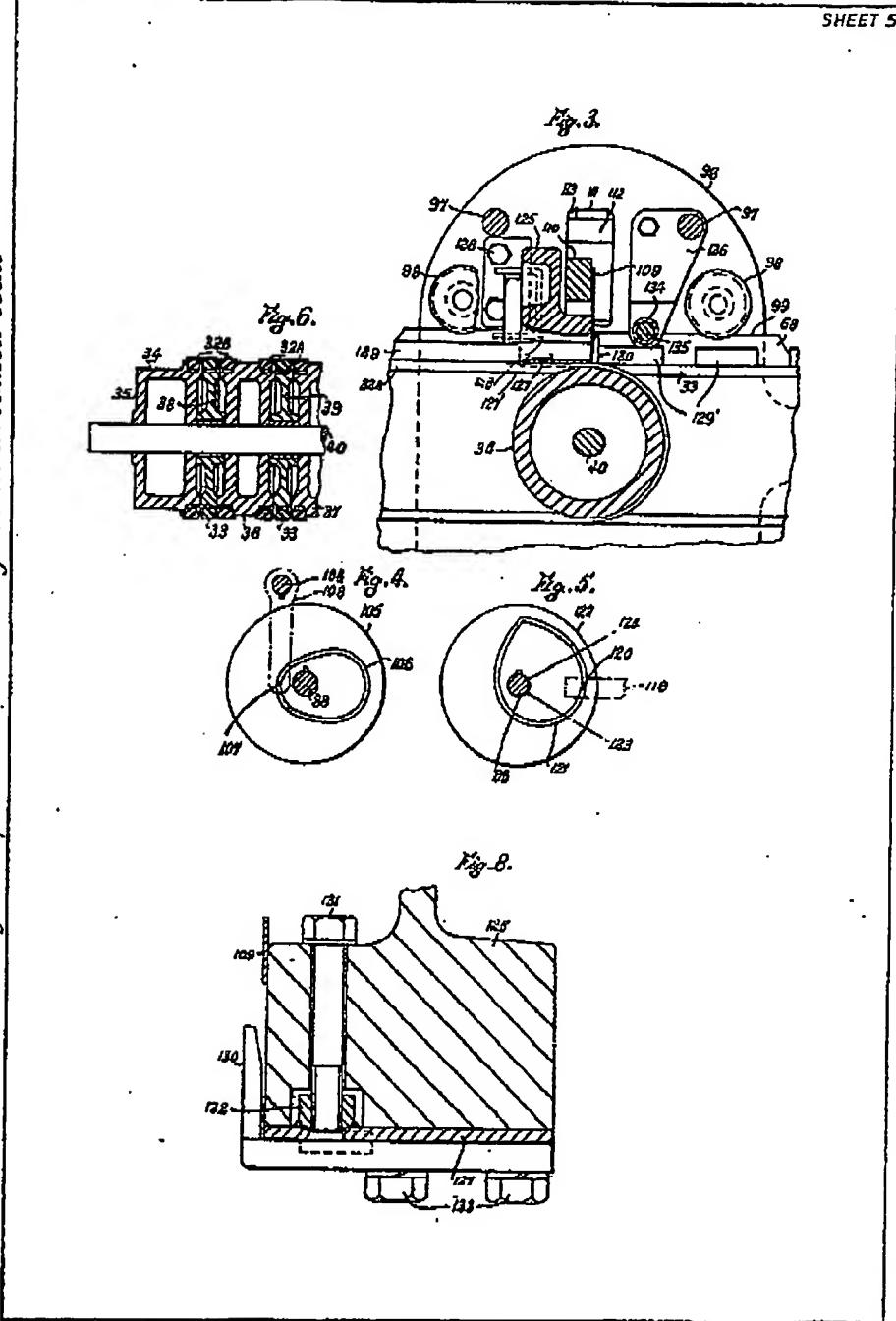
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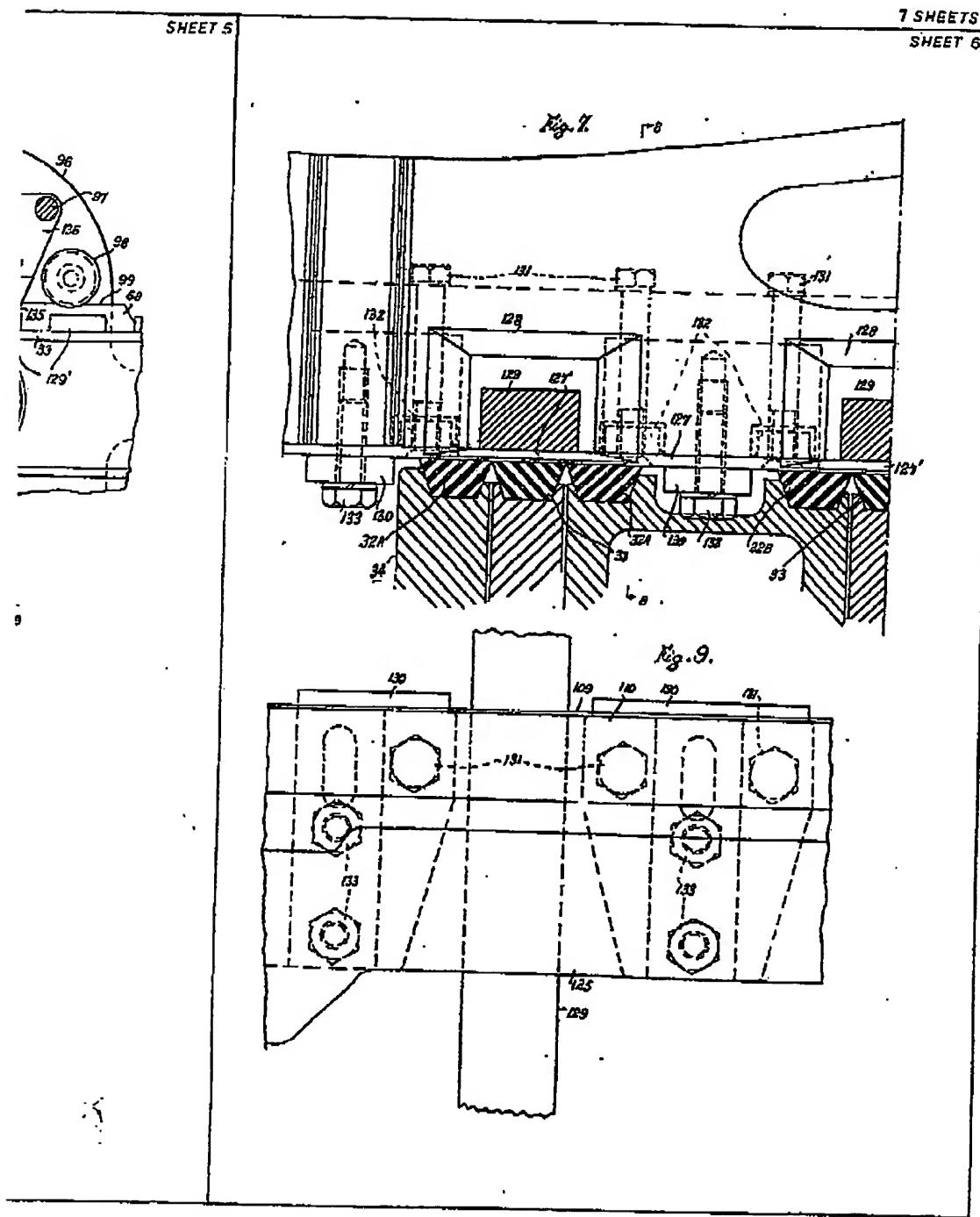


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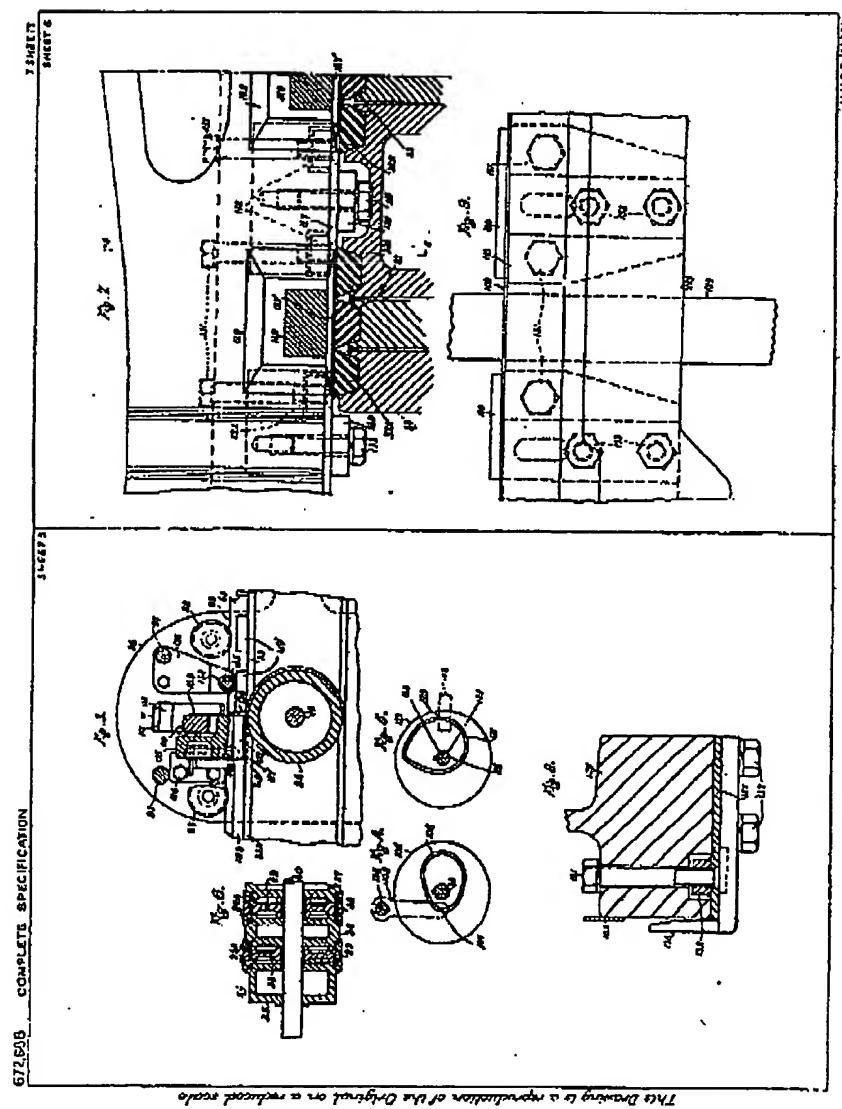
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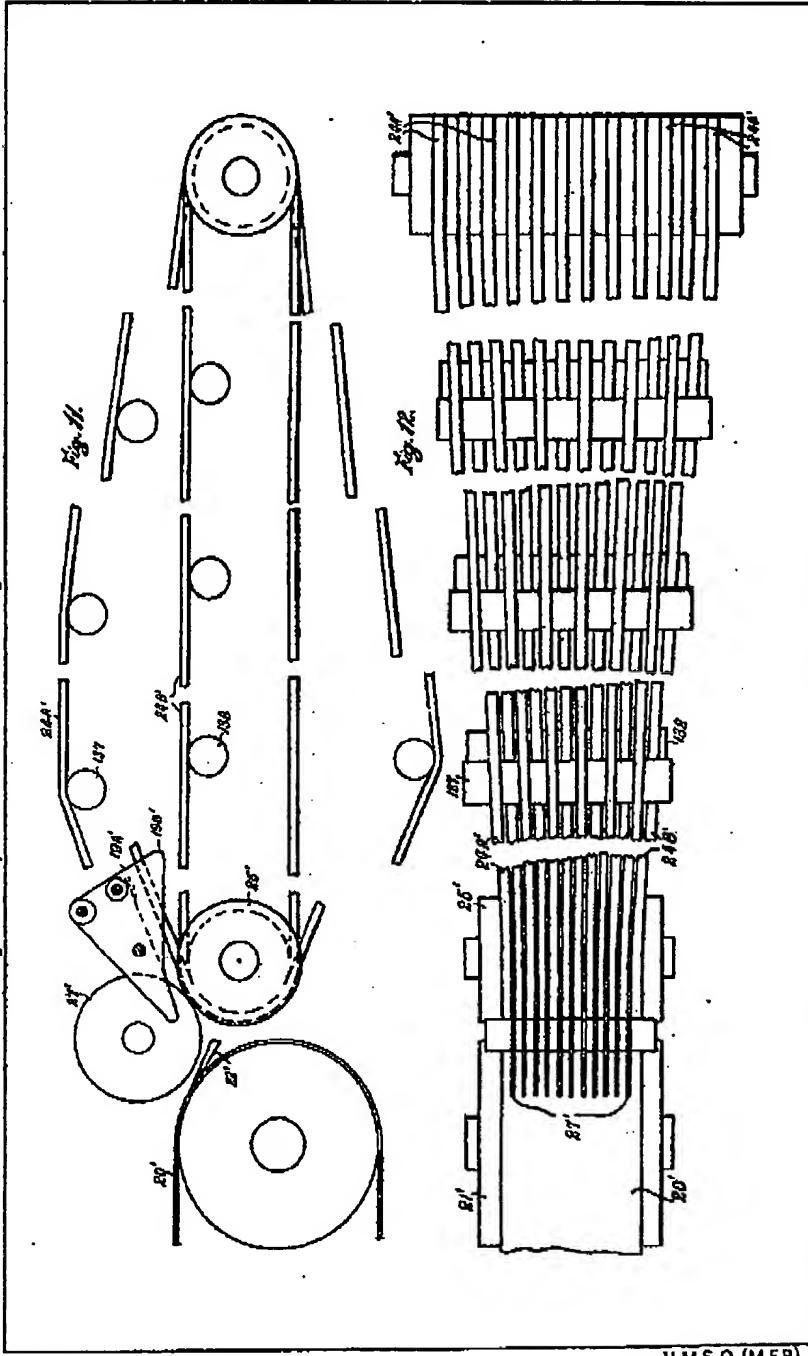
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